RIGHT PARADUODENAL HERNIA

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A PARADUODENAL HERNIA is a condition in which most of all the small intestine is incarcerated behind the folds of the mesocolon, making its entrance in the area of the duodenojejunal junction. This type of hernia comes under the classification of an internal or retroperitoneal hernia and comprises 53 per cent of all the internal herniae found. Two types occur: (1) Right paraduodenal hernia; and (2) left paraduodenal hernia. The latter is the more common, the ratio being about three to one. There have been 47 cases of right paraduodenal hernia reported, operation having been performed in 28 instances, with 15 recoveries.

The following conditions are usually found in a right paraduodenal hernia (Moynihan[19]): (1) The sac occupies the right half of the abdominal cavity, lying behind the ascending and transverse mesocolon; (2) the orifice is situated to the left of the sac; and (3) in the anterior margin of the sac, there lies either the superior mesenteric artery or a continuation of it, the ileocolic artery.

The case herewith reported is of interest because of its rarity and the unusual anatomic derangement associated with the hernia.

Case Report.—A female, age 49, was admitted to the hospital, September 17, 1939, complaining of vomiting, abdominal pain, and distention. The patient did not speak English and her history was obtained with difficulty through a Spanish interpreter. She stated that since the age of one year she had had "stomach trouble" consisting of attacks of abdominal pain with distention and occasional vomiting and diarrhea. These attacks were irregular but occurred at least once every three months. In 1929, she was told by a physician that she had an ulcer of the stomach. She followed a modified Sippy diet for a short time without improvement. She had observed that the severity and duration of the paroxysms were diminished on lying down. Every attack had been precipitated while she was on her feet. Food idiosyncrasies apparently had nothing to do with the onset of her periods of illness as she had been incapacitated at times when she had not eaten. September 1, 1939, the patient began having pain in the lower abdomen which soon radiated to her epigastrium and was accompanied by vomiting. This lasted six hours and was relieved following an enema. A diarrhea developed following this episode but rapidly subsided. The stools had a normal color. The patient had never menstruated, had been married 25 years, and had never been pregnant. She stated that she had had heart trouble, but the history of this was vague.

Three days before admission, September 14, 1939, the patient developed pain in her lower abdomen following the ingestion of some corn. The pain soon became generalized, and vomiting and distention of the abdomen became evident. Daily enemas did not produce fecal material and the symptoms persisted.

The relevant physical findings were obvious signs of dehydration, an oral temperature of 100° F., a blood pressure of 170/100, cardiac enlargement to the left, a distended and tympanitic abdomen, with exaggerated borborygmi, which could be auscultated over the entire abdomen, and generalized tenderness with rebound tenderness. All the labora-

tory findings were normal (blood count, Kline, and uranalysis). *Clinical Diagnosis:* Intestinal obstruction.

She was given intravenous fluids of glucose and normal saline, a Miller-Abbott tube was started, and a barium enema was given. The roentgenologic diagnosis, made by Dr. E. Hayden, was obstruction in the jejunum or proximal ileum, constriction of the midtransverse and sigmoid colon (Fig. 1), and apical tuberculosis was found by fluoroscopy. The patient's symptoms were not improved after eight hours of treatment, and it was thought advisable to explore the abdomen, as strangulation of the intestine was feared.

Operation.—Under cyclopropane anesthesia, a low midline incision was made. On opening the peritoneal cavity a confusing anomaly of the anatomy was found. No small intestine was to be seen. The transverse colon lay in the pelvis, attached by firm adhesions to the descending colon, the sigmoid, the peritoneum overlying the bladder and to the pelvic viscera. The adhesions between the transverse colon and the vesico-uterine peritoneum were cut to allow exploration of the pelvis. It was found that an infantile genital system existed. Superior to the transverse colon a mass could be palpated but not visualized. The incision was extended upward and around the umbilicus. At this point a mass could be seen which filled the upper portion of the abdomen. Intestines were seen to be enclosed in the tumor and it was recognized that a paraduodenal hernia was present. An attempt was made to find the opening leading into the sac but none was found. The hernial sac wall, consisting of the gastrocolic ligament and the mesentery of the ascending colon, was opened through an avascular area. The intestines were reduced through this opening; and it was found that the entire jejunum and greater portion of the ileum were contained in the hernial mass. There were several areas of purplish discoloration present in the bowel wall which recovered their normal color after reduction. By manually exploring the hernial cavity, the orifice was found to the left of the sac. This could be visualized only after adhesions between the transverse and descending colon were freed and the ptosed transverse colon retracted medially. The orifice was fully three inches in length, and the superior mesenteric artery traversed its anterior margin. The first portion of the jejunum entered the upper angle of the orifice into the hernial cavity and the distal end of the ileum emerged from the lower portion. By traction the intestine which had been incarcerated was pulled through the hernial orifice. Due to the length of the gastrocolic ligament, and the adhesions between the transverse colon and lower abdominal viscera, the position of the small intestines was still abnormal but ample room was afforded for them posterior to the gastrocolic ligament and superior to the transverse colon (Fig. 2). The hernial orifice was sutured with interrupted sutures of silk and the abdomen was closed in layers.

The patient's condition was good at the end of this procedure and continued so until the second postoperative day when signs of cardiac decompensation were observed. Digitalis was started followed by rapid improvement, after which the patient's recovery was uneventful. She was discharged from the hospital October 8, 1939, and has had no further signs of obstruction and no abdominal pain.

By reviewing the embryology of the intestine, the formation of a paraduodenal hernia can be better understood. The primitive gut arises in the human embryo when the entoderm is folded into a simple tube. This opens into the yolk stalk and is supported on the dorsal wall by the mesentery. During the fifth week the attachment of the yolk stalk disappears, the anlage of the cecum is formed, and there is a rapid elongation of the small intestine, which causes it to be thrown into a loop opposite the point of attachment of the yolk stalk. This loop rotates counterclockwise, and as a result the cecal

portion of the intestine lies to the left and the small intestine to the right (Plate I—Fig. 1). The small intestine continues to lengthen so rapidly that it can no longer be accommodated in the abdominal cavity, and, at seven weeks, it herniates into the umbilical coelom (Plate I—Fig. 2). The hind gut (major portion of the large intestine) is retained in the abdomen. In embryos of ten weeks the intestine returns into the abdominal cavity and the coelum is obliterated. The proximal coils of the small intestine are reduced first behind the superior mesenteric artery while the cecum returns last. As a result there occurs a counter-clockwise rotation of 270° about the axis of the artery, throwing the duodenum behind and the transverse colon in front of the artery. Following the rotation the cecum lies to the right occupying a position immediately below the liver with the small intestines lying medially (Plate I—Fig. 3). In three- to six-months' fetuses the lengthening colon causes the cecum and cephalic end of the colon to descend toward the pelvis, and the ascending colon is thus established (Plate I—Fig. 4).

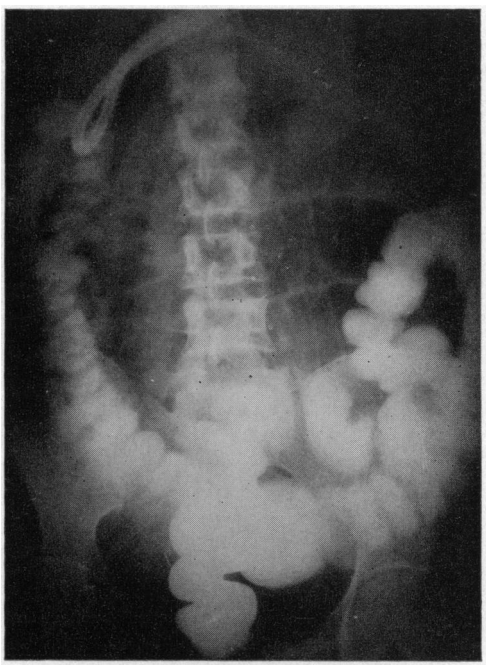

FIG. 1.—Roentgenogram of abdomen following barium enema showing dilated loops of small intestine and ptosis of transverse colon. The diagnosis of paraduodenal hernia could not be made from this film.

With the elongation of the intestines, the mesentery grows correspondingly and is carried with the intestine in its rotation. The superior mesenteric artery serves as the axis for the rotation. The axis is accentuated as the cecum descends and the mesentery is spread out like a funnel. During the fourth month the descending and ascending colons and their mesenteries fuse with the dorsal peritoneum (Plate I—Fig. 4).

The process just described is the normal development of the gut. Paraduodenal herniae are the result of an abnormal rotation of the intestine.

The formation of right paraduodenal herniae has been excellently described by Andrews,[1] and will be briefly reviewed. During the tenth week, when the intestine leaves the umbilical coelum, if an incomplete rotation of the cecum is present, this portion of the gut would lie inferior to the small intestines (Plate I—Fig. 5). As it grows to the right it would scoop up the small intestines in its mesentery (Plate I—Fig. 6), and when fusion occurs, during the fourth month (Plate I—Fig. 7), the small intestines would be imprisoned posterior to the mesentery.

The first paraduodenal hernia to be diagnosed preoperatively was reported in 1930, by Taylor.[23] Only two such diagnoses have been made, and these were made roentgenologically. A large number of patients with these herniae do not have symptoms and the anomaly is found at necropsy. In other cases

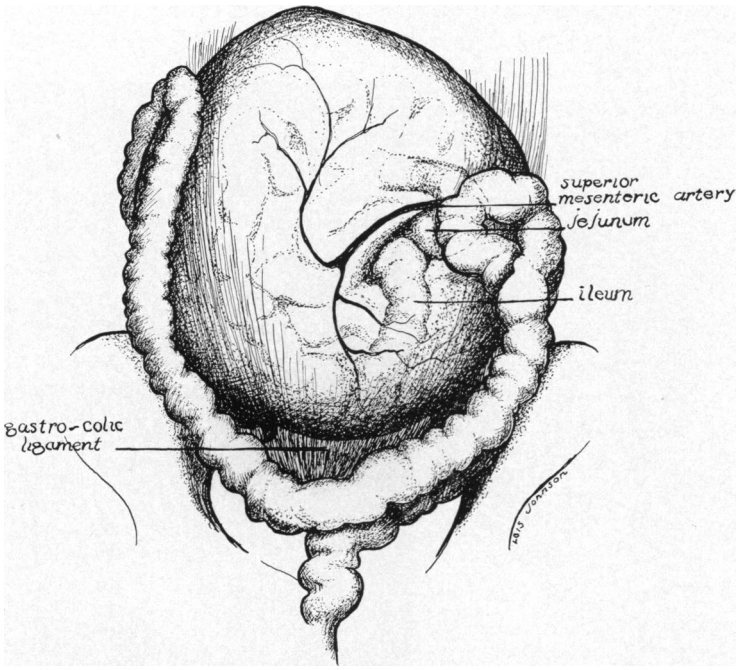

FIG. 2.—Drawing showing the anatomic relations found at operation. The paraduodenal hernia's anterior wall consisted of the mesentery of the transverse colon and gastrocolic ligament. The transverse colon lay inferior to the sac, and a portion of the colon overlapped the hernial orifice.

there are indefinite symptoms of colic-like abdominal discomfort which may be transient and with or without vomiting. The diagnosis of gallbladder disease, "dyspepsia," pyloric spasm, *etc.*, may be made. Again, there may be a sudden onset of symptoms indicating an acute intestinal obstruction. Bile is frequently present in the vomitus, but fecal vomiting is uncommon due to the usually high site of the obstruction. Moynihan[19] and Garber[11] both consider the chief diagnostic signs to be: Repeated attacks of abdominal colic; abdominal tenderness, with distention relieved by the passing of flatus; visible peristalsis; and a palpable, tympanitic, elastic mass in the abdomen. Scheele[21] claims that roentgenograms taken following a barium meal show retention in the stomach and duodenum, with a bow-shaped closing off of the upper intestinal shadow. A barium meal is contraindicated in cases with acute symptoms. Exner[8] states that the clumped appearance of the intestinal coils, shown in a "flat" roentgenogram, as if they were contained in a sac, is a characteristic sign of paraduodenal hernia. In large herniae, such as the

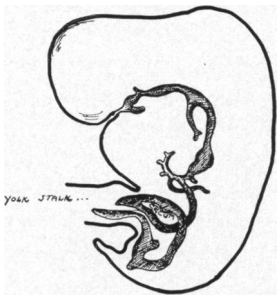

FIGURE 1

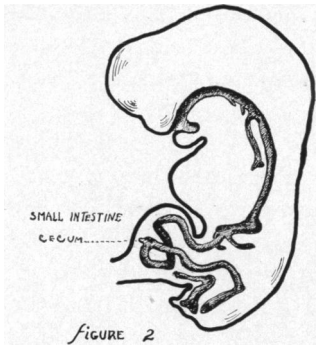

FIGURE 2

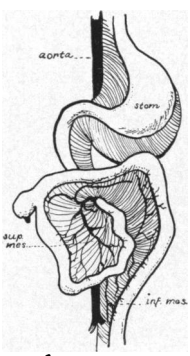

FIGURE 3

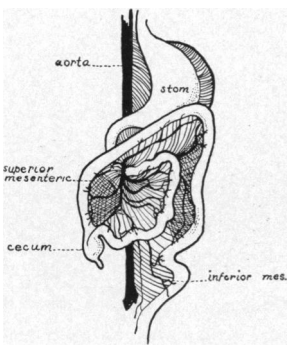

FIGURE 4

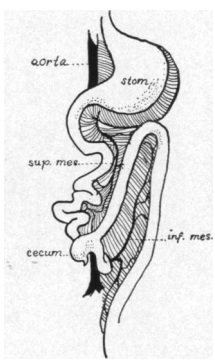

FIGURE 5

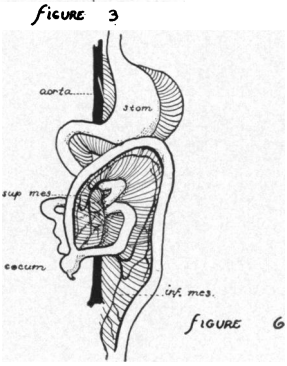

FIGURE 6

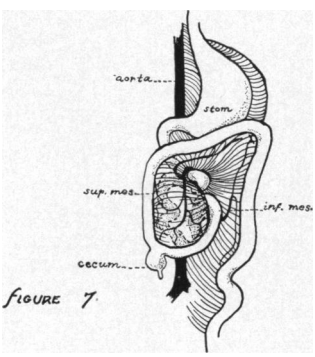

FIGURE 7

PLATE I

FIG. 1.—Diagrammatic fifth-week embryo showing counterclockwise rotation of the intestinal loop.

FIG. 2.—Seventh-week embryo with herniation of the small intestine into the umbilical coelom.

FIG. 3.—Position of large and small intestine following normal rotation in a ten-week embryo.

FIG. 4.—Normal rotation complete, with cecum in right lower aspect of the abdominal cavity. Shadowed areas represent areas of fusion between the mesenteries and the posterior peritoneum.

FIGS. 5 and 6.—Illustrating the relative positions of the large and small intestine when incomplete rotation occurs. The cecum lies inferior to the small intestine and as it grows to the right the small intestine is caught and enclosed in its mesentery. (After Andrews.[1])

FIG. 7.—In the fourth month the fusion of the mesentery and peritoneum has incarcerated the small intestine and completed the right paraduodenal hernia. Note that all conditions of the right paraduodenal hernia are reproduced; the sac and its contents occupy the right portion of the abdomen, the orifice is to the left of the sac, and the superior mesenteric artery lies in the anterior margin of the sac.

one described above, there is no roentgenographic evidence that the intestines are enclosed within a limited space.

The treatment advisable for this condition depends largely on the symptoms and findings present. Those herniae found in the course of the abdominal surgery should be reduced and the neck of the sac closed. When signs of an intestinal obstruction are present, the treatment should be the same as in any other case of obstruction. In cases with evidence of strangulation, surgery should not be delayed. If the hernial orifice cannot be located, an avascular area on the sac wall can be opened and the cavity explored manually. It was only by this method that the opening was found in the above described case. Caution must be exercised to protect the vital blood vessels which run in the wall of the sac. After the orifice is definitely located, the intestines can be drawn through the aperture into the general abdominal cavity and the opening closed. This last step is important as recurrences have been reported which resulted from an improper primary closure. "Because of the technical difficulties produced by the distortion of the anatomy, the mortality still remains high. This can be reduced only by a more thorough grasp on the part of the operating surgeon of the anatomic anomalies at hand" (Longacre[17]).

SUMMARY

A case of right paraduodenal hernia is presented which, as far as could be determined, is the forty-eighth case to be reported; the twenty-ninth case to be operated upon; and the sixteenth to recover. The anatomic arrangement found was interesting not only because of the hernia present but also because of the presence of an infantile genital system, and of the position of the colon in the pelvis. The cause of the generalized adhesions in the abdomen was not determined. It is logical to believe that they were a result of an old tuberculous peritonitis as they were of the right consistency and distribution. The presence of an apical tuberculosis adds further weight to the possibility of this etiology.

We wish to express our appreciation to Dr. W. Steen, who conducted the medical management of this case and was instrumental in obtaining the patient's history.

BIBLIOGRAPHY

[1] Andrews, E.: Duodenal Hernia:—A Misnomer. Surg., Gynec., and Obstet., **37**, 740, 1923.

[2] Arey, L. B.: Developmental Anatomy. Philadelphia, W. B. Saunders Co., 1926.

[3] Arnold, I. A.: Hernia into the Paraduodenal Fossa with Obstruction Due to Large Biliary Calculus. J.A.M.A., **112**, 1245, 1939.

[4] Averbach, B. F.: Right Paraduodenal Hernia. Am. Jour. Surg., **35**, 128, 1937.

[5] Baumeister, C., and Hanchett, M. C.: Right Paraduodenal Hernia. Arch. Surg., **37**, 327, 1938.

[6] Bryan, R. C.: Right Paraduodenal Hernia. Am. Jour. Surg., **28**, 703, 1935.

[7] Dowdle, E.: Right Paraduodenal Hernia. Surg., Gynec., and Obstet., **54**, 246, 1932.

[8] Exner, F. B.: The Roentgen Diagnosis of Right Paraduodenal Hernia. Am. Jour. Roentgenol., **29**, 585, 1933.

[9] Frazier, J. E.: Manual of Embryology. London, Bailliere, Tindall and Cox, 1931.
[10] Frazier, J. E., and Robbins, R. H.: Factors Concerned in Causing the Rotation of the Intestine in Man. Jour. Anat. and Physiol., **50**, 75, 1916.
[11] Garber, N.: Arch. klin. Chir., **153**, 316 (quoted from Longacre[17]).
[12] Halpert, B.: Right Retromesocolic Hernia. Surgery, **3**, 579, 1938.
[13] Hansmann, G. H., and Morton, S. A.: Intra-abdominal Hernia. Arch. Surg., **39**, 973, 1939.
[14] Haymond, H. E., and Dragstedt, L. R.: Anomalies of Intestinal Rotation. Surg., Gynec., and Obstet., **53**, 316, 1931.
[15] Landzert, T.: Über die Hernia Retro-Peritonealis. Beitr. z. Anat. u. Histol., **1**, 1872, St. Petersburg.
[16] Latta, J.: Personal communication.
[17] Longacre, J. J.: Mesentericoparietal Hernia. Surg., Gynec., and Obstet., **59**, 165, 1934.
[18] Masson, J. C., and McIndoe, A. H.: Right Paraduodenal Hernia and Isolated Hyperplastic Tuberculous Obstruction. Surg., Gynec., and Obstet., **50**, 29, 1930.
[19] Moynihan, B. G. A.: On Retroperitoneal Hernia. New York, William Wood and Co., 1906.
[20] Novak, E., and Sussman, A. A.: Right Paraduodenal Hernia—Recovery After Operation. J.A.M.A., **82**, 1664, 1924.
[21] Scheele, K.: Zentralbl. f. Chir., **48**, 188, 1921 (quoted from Longacre[17]).
[22] Snyder, J. W.: Paraduodenal Hernia. Surgery, **5**, 389, 1939.
[23] Taylor, J.: The X-ray Diagnosis of Right Paraduodenal Hernia. Brit. Jour. Surg., **17**, 639, 1930.